

# Interruption Recovery and Awareness of Changes – Design Principles and Display Technology

## OPERATIONAL PROBLEM

Dynamic operational environments of many kinds, from airspace monitoring to civil emergency operations, require maintaining awareness of dynamic situations, in part by detecting and interpreting significant changes. Poor change detection ability makes this maintenance difficult enough while monitoring a situation display uninterrupted, but multi-tasking and interruptions increase the difficulty because the situation can change during the interruptions.

## SOLUTION

PSE identified a set of display design principles for maintaining situation awareness in dynamic environments and across interruptions. These principles were derived and tested empirically. PSE also developed and tested display concepts (called CHEX, for Change History made Explicit) that embody those principles. These concepts can be applied widely to improve operator situation

## APPROACH

The process begins by interviewing operators for their critical information requirements, focusing on changes that impact situation assessment. Automation is then developed to automatically detect these changes and log them to a graphical dashboard. The dashboard can be scanned rapidly at any time. Selecting logged changes highlights the item on the situation display for easy review. Changes are notified unobtrusively yet effectively and access to detail is easy yet uncluttered.

The CHEX display concept has been applied to air defense, surface warfare, unmanned vehicle control, network operations, and tactical team communications.

## VALUE TO THE WARFIGHTER

Improving situation awareness, particularly for recent changes, can dramatically improve response times and security as well as help operators maintain overall situation awareness. As situations become more complex and dynamic, these benefits magnify. Empirical tests have found 80% faster detection of critical changes and no misses when operators used PSE's change dashboard tool compared with typical information displays in a realistic Naval airspace monitoring task.

## Reference

St. John, M. & Smallman, H. S. (2008). Staying up to speed: Four design principles for maintaining and recovering situation awareness. *Journal of Cognitive Engineering and Decision Making*, 2, 118-139.



Change History		
Time	Track	Change
02:53	7060	Cross Warn
02:46	7034	Cross Warn
02:04	7059	Cross Warn
01:30	7052	Leave Airplane
01:24	7021	Cross Notify
01:10	7056	Cross Warn
00:45	7021	Detect Track
00:34	7050	Cross Warn
00:10	7060	Cross Query
00:04	7034	Cross Query

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